

Claims

1. A capacitor comprising:
a cathode including a porous coating of an
5 amorphous metal oxide of at least one metal selected
from the group consisting of ruthenium, iridium,
nickel, rhodium, rhenium, cobalt, tungsten, manga-
nese, tantalum, molybdenum, lead, titanium, plati-
num, palladium, and osmium;
10 an anode spaced from the porous coating and
including a metal selected from the group consisting
of tantalum, aluminum, niobium, zirconium, and tita-
nium and spaced from the porous coating, wherein the
metals of the anode and cathode are different; and
15 an electrolyte disposed between and in con-
tact with the porous coating and the anode.
2. The capacitor of claim 1 wherein the coat-
ing is supported by a substrate selected from the
20 group consisting of tantalum, titanium, and an elec-
trically conductive polymer.
3. The capacitor of claim 1 wherein the anode
is porous sintered tantalum having an oxide coating.
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4. The capacitor of claim 1 wherein the porous
coating includes a mixture of at least one amorphous
oxide chosen from the group consisting of oxides of
ruthenium, iridium, nickel, rhodium, platinum, pal-
30 ladium, and osmium and at least one amorphous oxide
chosen from the group consisting of oxides of tanta-
lum, titanium, and zirconium.
5. The capacitor of claim 1 wherein the porous
35 coating includes a mixture of amorphous oxides of

ruthenium and tantalum.

6. The capacitor of claim 1 wherein the cathode comprises two opposed electrically conducting plates, each plate including the porous amorphous metal oxide coating, the porous amorphous metal oxide coatings facing each other, the anode is disposed between and spaced from each of the porous amorphous metal coatings, and the electrolyte is in contact with each of the porous amorphous metal coatings.

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7. A capacitor comprising:
a first electrically conductive body;
a cathode comprising a porous coating including an amorphous non-crystalline oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium, and osmium disposed on the first electrically conductive body;
an anode including a metal selected from the group consisting of tantalum, aluminum, niobium, zirconium, and titanium disposed on a second electrically conductive body opposite and spaced from the first electrically conductive body, wherein the metals of the anode and cathode are different; and
an electrolyte disposed between and in contact with the porous coating and the anode.

8. The capacitor of claim 7 wherein the electrolyte is a fluid and including a sealant contacting the electrically conducting plates and containing the electrolyte within the capacitor.

9. The capacitor of claim 8 including spacers maintaining a separation between the anode and the porous coatings.

5 10. The capacitor of claim 7 wherein the first electrically conductive body is selected from the group consisting of tantalum, titanium, and an electrically conductive polymer.

Sub A27 10 11. A capacitor cell comprising:
 a first electrically conductive body;
 a cathode comprising a porous coating including an oxide of at least one metal selected from
15 the group consisting of ruthenium, iridium, nickel, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium, and osmium disposed on the first electrically
 conductive body;
 a second electrically conductive body
20 spaced from the porous coating;
 an anode including a metal selected from the group consisting of tantalum, aluminum, niobium, zirconium, and titanium disposed on the electrically
 conductive metal body opposite the first electrically
25 conductive body; and
 an electrolyte disposed between and in contact with the porous coating and the anode.

30 12. The capacitor of claim 11 wherein the porous amorphous metal oxide coating includes a mixture of at least one amorphous oxide chosen from the group consisting of amorphous oxides of ruthenium, iridium, nickel, rhodium, platinum, palladium, and osmium and at least one amorphous oxide chosen from
35 the group consisting of amorphous oxides of tanta-

lum, titanium, and zirconium.

13. The capacitor of claim 11 wherein the porous coating includes a mixture of oxides of ruthenium and tantalum.

14. The capacitor of claim 11 wherein the first electrically conductive body is selected from the group consisting of tantalum, titanium, and an electrically conductive polymer.

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15. A capacitor comprising:
a plurality of capacitor cells, each cell including a first metal body having opposed first and second surfaces;
a cathode comprising a porous coating including an amorphous non-crystalline oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium, and osmium disposed on the first surface of said first metal body;
an anode including a metal selected from the group consisting of tantalum, aluminum, niobium, zirconium, and titanium disposed on the second surface of the first metal body, wherein the metals of the anode and cathode are different;
an electrolyte in contact with the cathode opposite the first metal body wherein the plurality of the capacitor cells are disposed in a serial arrangement, the electrolyte of one cell contacting the second surface of each first metal body and a first surface of the first metal body of the next adjacent cell;

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a second metal body having first and second opposed surfaces disposed at one end of the serial arrangement and including a cathode comprising a porous coating including an amorphous non-crystalline oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, and cathode are different, platinum, palladium, and osmium disposed on one side of the second metal body and opposite an anode of a first metal body in the serial arrangement, but no anode, and functioning as a cathode of the capacitor and an electrolyte disposed between and contacting the porous coating of the second metal body and the anode of the opposite first metal body in the serial arrangement; and

a third metal body having first and second opposed surfaces and disposed at the other end of the serial arrangement and including an anode comprising a metal selected from the group consisting of tantalum, aluminum, niobium, zirconium, and titanium disposed on one side of the third metal body and opposite a porous coating of a first metal body in the serial arrangement, but no porous coating, and functioning as an anode of the capacitor and an electrolyte disposed between and contacting the anode of the third metal body and the porous coating of the opposite first metal body in the serial arrangement.

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16. The capacitor of claim 15 wherein each anode is a porous sintered tantalum body coated with an oxide of tantalum.

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17. The capacitor of claim 15 wherein the porous amorphous metal oxide coating includes a mixture of at least one amorphous metal oxide chosen from the group consisting of oxides of ruthenium, iridium, nickel, rhodium, platinum, palladium, and osmium and at least one amorphous metal oxide chosen from the group consisting of oxides of tantalum, titanium, and zirconium.

18. The capacitor of claim 15 wherein the porous coating includes a mixture of oxides of ruthenium and tantalum.

19. The capacitor of claim 15 wherein the first ^{metal} ~~electrically conductive~~ body is selected from the group consisting of tantalum, titanium, and an electrically conductive polymer.